CINT Integration Laboratories (1501, 1504, 1523, 1525, and 1527)

Project Information

Entered By: STARR,MICHAEL D.		
Entered by Org: 01131	**Entered by Mail Stop:** 1315	**Entered by Phone:** (505) 844-0046
Owner Name: STARR,MICHAEL D.		**Owner User ID:** MSTARR
Owner Org: 01131	**Owner Mail Stop:** 1315	**Owner Phone:** (505) 844-0046
Project Start/End Dates: 04/13/2007 - ONGOING		

Who/What? Description:

Sandia National Laboratories/New Mexico (SNL/NM), Organization 01132, CINT User Program, proposes five new laboratories in the Center for Integrated Nanotechnologies (CINT) Core Facility. These laboratories would be the Electron Beam Lithography Room, the High Resolution Laboratory, the Lithography Bay, the Metal Deposition Laboratory, and the Etch Laboratory.

Why? Purpose and Need:

These laboratories are vital for the research activities that are proposed for the CINT Core Facility.

When? Schedule Details (Milestones):

Project Details:

The five integration laboratories that are proposed for operations in the CINT Core Facility are the:

Electron Beam Lithography Room - Bay 1501
High Resolution Lab - Bay 1504
Lithography Bay - Bay 1523
Metal Deposition Lab - Bay 1525
Etch Lab - Bay 1527

The primary function and location of each laboratory would be as follows:

Electron Beam Lithography Room - Bay 1501: operations and maintenance for the electron beam lithography tool and support tools, point of use controls in the clean room (if any), supporting equipment, and associated hazardous production materials.

High Resolution Lab - Bay 1504: The E-Beam Lithography Area includes normal operations and maintenance for the focused ion beam tool / secondary electron microscope tool. The primary function of the tool would be to micro-machine silicon (Si) micro-fabricated parts into unique geometries using a 10 nanometer wide stream of ionized gallium in a vacuum chamber. The chamber is exhausted to the centralized house exhaust system.

Lithography Bay - Bay 1523: Operations would include processes and associated metrology of contact mask lithography. This would include processing of industry standard photoresist, which typically requires spinning the photoresist on a wafer followed by exposing using an ultraviolet (UV) contact mask aligner, and baking at 250 C on a hot plate or in a oven. The photoresist is then typically developed using a base such as TMAH and can then be removed using a solvent. Metrology equipment used in this process typically would include a profolometer to measure resist heights and an optical microscope for visual inspection.

Metal Deposition Lab - Bay 1525: this bay would contain multiple vacuum deposition systems (base pressure 10^-7 torr) for the directional depositing of high purity material typically used in lift-off and subtractive etching processes.

Additionally, the sputter deposition tool could be configured for sputter deposition of metals or dielectrics.

The chemical benches would be used for standard processing of devices fabricated on Si wafers. Typical processes would include the removal of photoresist, and degreasing using solvents, etching of metals, Si, and silicon dioxide (SiO2), and other standard processes.

The rapid thermal annealer (RTA) would use a set of bulbs to rapidly heat silicon wafers to temperatures in excess of 1000 C in an inert environment, such as nitrogen (N2) or argon. Additionally, forming gas (3% hydrogen [H2] in argon) could be used to prevent oxide formation during annealing.

Etch Labs - Bay 1527: Bay 1527 would have two inductively coupled plasma (ICP) etch systems and a plasma enhanced chemical vapor deposition (PECVD) system. The PECVD system would allow the conformal deposition of multiple types of dielectrics and other materials, such as poly-Si, silicon nitride, and silicon oxides. The ICP etch systems are used for dry etching aluminum, carbon, oxides, nitrides, polysilicon, among other materials. The toxic gasses are self-contained within built-in toxic gas cabinets in each tool. There are toxic gas monitoring sensors located in each of the gas cabinets, and in the vicinity of the tools, to detect leaks.

Below are the corresponding PHS numbers for each laboratory and the status of each PHS:

CINT Rm: 1501 - Electron Beam Lithography Room - SNL06A00462-001 (Approved)
CINT Integration lab # 1504 - SEM/FIB - SNL06A00989-001 (Preparation)
CINT Rms: 1522 & 1523 - Lithography Bay and Chase - SNL06A00922-001 (Approved)
CINT Rm: 1525 - Metal Deposition Lab - SNL07A00125-001 (Preparation)
CINT Rm: 1527 - Etch Lab - SNL07A00126-001 (Preparation)

Funding Source: DOE

Funding Source Number:

EDP Number:

Locations				
Site	**Area**	**Building**	**Room**	**Description**
SSTP				*CINT Integration Lab - Bay 1501*
SSTP				*CINT Integration Lab - Bay 1504*
SSTP				*CINT Integration Lab - Bay 1523*
SSTP				*CINT Integration Lab - Bay 1525*
SSTP				*CINT Integration Lab - Bay 1527*

Associated PHS Documents	
PHS Number	**PHS Title**
SNL06A00462-001	CINT Rm: 1501 - Electron Beam Lithography Room
SNL06A00922-001	CINT Rms: 1522 & 1523 - Lithography Bay and Chase

Attachments

Attachment Name	Description
NONE FOUND	

Other Interested Parties				
Role	**Name**	**Organization**	**Phone**	**Email cc:**
NONE FOUND				

Will any part of your work take place on KAFB but outside the SNL/NM Technical Areas? ☐ **Yes** ☒ **No**

Air Force Permit Number:

Do you require an AF813? ☐ **Yes** ☐ **No**

AF813 Tracking Number:

CINT Integration Laboratories (1501, 1504, 1523, 1525, and 1527)

What kind of project/activity is this?

		Yes	No
1.	Is this a new project, test, or activity?	X	
2.	Is this a modification to an existing project, test, or activity?		X
3.	Is this new construction (new structure, building, infrastructure)?		X
4.	Is this a modification to or relocation of an existing structure, building, or infrastructure?		X
5.	Does this project involve only routine maintenance and/or custodial activities?		X

Additional information to decide if existing NEPA applies.

		Yes	No
1.	Would the project require acquisition of equipment of a kind not already in use in the facility, or replacement in kind of equipment that would substantially extend the life of the facility (for instance, replacing a reactor vessel)?		X
2.	Would the project require a major change in the kind of materials (such as petroleum products, chemicals, radioactive materials, and explosives) stored or used in the facility, or quantity (inventory) of materials used or stored?		X
3.	Would the project generate hazardous or radioactive wastes not already generated at this facility, or would quantities of wastes be increased?	X	
4.	Would the project generate new emissions or change the level of emissions from the facility?	X	
5.	Would the project cause a ground disturbance?		X
6.	Is the proposal connected to other actions with potentially significant impacts or other proposals with potential cumulative impacts?		X

CINT Integration Laboratories (1501, 1504, 1523, 1525, and 1527)

Event/Comment Log

Event Type	Comment	Name (Role)	Date/Time
STATUS CHANGE	NEPA Record status changed to QNR Review	STARR,MICHAEL (OWNER)	03/18/2007 12:42
STATUS CHANGE	NEPA Record status changed to SME Review	STARR,MICHAEL (ISMS_NEPA_QNR)	03/18/2007 12:43
STATUS CHANGE	NEPA Record status changed to LM Review	BAYLISS,LINDA SUE (ISMS_NEPA_SME)	03/29/2007 10:35
STATUS CHANGE	NEPA Record status changed to Action Complete by SNL	SHINN,NEAL D. (ISMS_Manager)	03/30/2007 07:16

SNL Recommendation to DOE

No recommendation to DOE recorded.

Project Summary

CINT Integration Laboratories (1501, 1504, 1523, 1525, and 1527)

Entered By: STARR,MICHAEL D.	**Entered by Mail Stop:** 1315
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Owner Name: STARR,MICHAEL D.	**Owner Mail Stop:** 1315
Owner Org: 01131	**Owner Phone:** (505) 844-0046
Date Created: 03/13/2007	**Date Completed:** 03/29/2007
Line Manager Review Date Completed: 03/30/2007	**Line Manager Reviewer:** SHINN,NEAL D.
Project Status: Action Complete by SNL	**SNL Completing Reviewer:** BAYLISS,LINDA SUE

NEPA Determination and Selected Document(s):
SNL cited existing NEPA document

EA DOE/EA-1457 Environmental Assessment for the Center for Integrated Nanotechnologies at Sandia National Laboratories/New Mexico - Final Environmental Assessment

Selected Document Details:
CINT laboratory operations have been evaluated in DOE/EA-1457, "Environmental Assessment (EA) for the CINT at Sandia National Laboratories/New Mexico (SNL/NM)", dated March 2003. The EA includes an assessment of the operations that would be performed in the CINT Core Facility. This NEPA Compliance Review focuses on five Integration Laboratories (Rooms 1501, 1504, 1523, 1525, and 1527). The proposed work in these laboratories would fall under one or more of the five primary research areas analyzed in Section 2.3, pages 8 - 12 of the EA, Proposed Action Operations: Nano-Bio-Micro Interfaces; Complex Functional Nanomaterials; Nanomechanics; Nanophotonics and Nanoelectronics; and Theory and Simulation.

All of these laboratories were included in the group of labs that were initially planned for the CINT. The equipment that would be used was included in the analysis of the CINT for the Environmental Assessment, and the air emissions, liquid effluents, and other waste streams were evaluated and planned for, and included in applicable permits.

Rationale:

U.S. DEPARTMENT OF ENERGY
Sandia Site Office
NEPA CHECKLIST

Project/Activity Title: CINT Integration Laboratories (1501, 1504, 1523, 1525, and 1527)	**NEPA ID Number:** SNA07-0202	**Date:**
Program Office: DOE	**Project/Activity Number:**	
Contact Name(s)- Owner: STARR,MICHAEL D., 01131, MS1315, (505) 844-0046 **NEPA SME:** BAYLISS,LINDA SUE, 10333, MS1042, (505) 845-7696	**Reviewed and Submitted By:** SHINN,NEAL D. 01131, MS1315, (505) 844-5457	

1.0 PROJECT/ACTIVITY DESCRIPTION: Include who, what, where, and why. (Attached)

2.0 ES&H CONCERNS: Identify ES&H issues in the following categories associated with the proposed project/activity. Attach an explanation for each item checked YES.

		Yes	No
Use and Storage			
2.1	Chemicals	X	
2.2	Petroleum/fuel products	X	
2.3	High energy sources/explosives		X
2.4	Pesticides/herbicides		X
Waste			
2.5	Solid waste	X	
2.6	Hazardous waste	X	
2.7	Radioactive waste/materials		X
2.8	Mixed waste (rad + haz)		X
Emissions			
2.9	Air emissions	X	
2.10	Liquid effluents (other than those described in 2.5 - 2.8)	X	

		Yes	No
Health & Safety Issues			
2.11	Radiation exposure		X
2.12	Chemical exposure	X	
2.13	Noise levels		X
2.14	Transport of hazardous materials/waste		X
Land Issues			
2.15	Clearing/excavation/land disturbance		X
2.16	Archaeological/cultural resources		X
2.17	Special status species/environment		X
2.18	Real estate issues		X
2.19	Related off-site activities		X
Special Issues			
2.20	Asbestos		X
2.21	Utility system modifications		X
2.22	Environmental restoration		X
2.23	Microorganisms/biological toxins		X
2.24	Fire danger/Other environmental concerns		X

2.25 Comments on ES&H Concerns? ☐ **Yes** ☒ **No**

3.0 OTHER REGULATORY REQUIREMENTS: Does the proposed project/activity require any local, state, or federal permits, permit modifications, or notifications? (This includes actions requiring regulator review and approval.)

☐ **Yes** ☒ **No**

Explain:

1.0 Project Description

1.1 Project Title:

CINT Integration Laboratories (1501, 1504, 1523, 1525, and 1527)

1.2 NEPA ID#: SNA07-0202

1.3 Project Contacts:

Role	Name	Org	Mailstop	Phone
Owner	STARR,MICHAEL D.	01131	1315	(505) 844-0046
Entered By	STARR,MICHAEL D.	01131	1315	(505) 844-0046
Nepa SME	BAYLISS,LINDA SUE	10333	1042	(505) 845-7696
ES&H Coordinator	STARR,MICHAEL D.	01131	1315	(505) 844-0046
Line Mgr. Reviewer	SHINN,NEAL D.	01131	1315	(505) 844-5457

1.4 Who/What?

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1.5 Why?

These laboratories are vital for the research activities that are proposed for the CINT Core Facility.

1.6 Where?

Site	Area	Building	Room	Description
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SSTP				*CINT Integration Lab - Bay 1504*
SSTP				*CINT Integration Lab - Bay 1523*
SSTP				*CINT Integration Lab - Bay 1525*
SSTP				*CINT Integration Lab - Bay 1527*

1.7 When? 04/13/2007 - ONGOING

1.8 Details

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CINT Rm: 1527 - Etch Lab - SNL07A00126-001 (Preparation)

2.0 Environmental Concerns

2.1 Chemicals

The range of chemicals that would be used in these laboratories would include standard laboratory compounds such as acids, solvents, organics, and inorganics. The volumes of chemicals would generally be low (approximately one gallon each). Approximately 25 liters/year of organic solvents (acetone, methanol, isopropanol, ethanol) would be used in laboratory operations.

Procedures for chemical use are documented in local SOPs and OPs and are consistent with the guidance provided by the SNL ES&H Manual (MN471001) and accepted best management practice.

Storage of chemicals would be done in accordance with the SNL ES&H Manual and would include separation of incompatible chemicals, secondary containment of liquids, and appropriate storage containers. Chemicals would be purchased using a Just-in-Time purchasing system that would allow quick delivery of chemicals, and therefore would reduce the need to stockpile and store chemicals. Small amounts of chemicals would be stored either in authorized flammable chemical storage cabinets, or metal cabinets, depending on the chemical.

Applicable SNL SOPs and OPs are in place and would be followed for chemical storage, use, and disposal.

Employees would receive training on handling and storage of these chemicals, and the handling of these chemicals would be in accordance with the SNL ES&H Manual and area-specific SOPs.

2.2 Petroleum/fuel products

Approximately 1 gallon/yr of vacuum pump oil would be used.

2.5 Solid waste

A total of approximately 700 pounds of solid waste, comprised mostly of used wipes and gloves, would be generated by the five bays in the integration laboratories, per year.

2.6 Hazardous waste

The chemical activities performed would generate liquid and solid hazardous waste. Waste minimization, including source reduction, recycling, and substitution would be employed and pursued where possible, consistent with programmatic requirements. The majority of waste would be in the form of dilute acids, and used or spent solvents.

A total of approximately 75 pounds of hazardous waste per year would be generated by the five bays in the Integration Laboratory.

Waste would be collected at the generation point, then transported and disposed of, in accordance with the SNL ES&H Manual, Chapter 19 (MN471001).

2.9 Air emissions

Approximately 25 liters/year of organic solvents (acetone, methanol, isopropanol, ethanol) would be used in laboratory operations. Most, if not all, work involving chemical laboratory processes would be performed in dedicated local exhaust systems, such as fume hoods, that may vent to the atmosphere. Therefore, there may be air emissions of regulated chemicals. Because the volume of chemicals that would be in use in these areas would be small, the potential emissions should also be small. On the basis of previous experience, previous air emission reporting, and expected chemical inventories and processes for these facilities, it is expected that the air emissions resulting from these processes would remain well below volumes regulated by state, federal, county, and city regulations.

2.10 Liquid effluents (other than those described in 2.5 - 2.8)

The liquid effluents produced by laboratory operations would consist primarily of sanitary waste, noncontact cooling water, and effluents from the cleaning of glassware. Maintenance activities on this equipment would produce volumes of used, recyclable oils, lubricants, and other petroleum products. The coolants would be recycled in areas where large volumes would be utilized. All other hazardous liquid waste would be disposed of in accordance with the SNL ES&H Manual, Chapter 19 (MN471001).

The wastewater permit for the facility has been obtained: permit No. 2238A, dated January 4, 2007.

2.12 Chemical exposure

The use of protective outer clothing and approved safety eyewear would be required in the laboratories when handling chemicals, or while others are handling chemicals in the laboratory. Nitrile, latex, or vinyl gloves would be worn during all operations. Eye protection, either safety eyewear with side shields or approved chemical goggles, would be worn during all operations. Disposable gloves would not be washed, reused, or used for touching clean surfaces (keyboards, telephones, etc.), and they would not be worn outside the lab. Persons would wash their hands after removing gloves and before leaving the laboratory.

For most situations, latex, vinyl, or nitrile gloves would be sufficient for routine laboratory work when prolonged contact with chemicals is not anticipated. Authorized Users who use these gloves in this manner would immediately remove and replace them if they come in contact with a chemical. Use of this type of glove should allow for better manual dexterity. If contact with chemicals can reasonably be anticipated, Authorized Users shall contact the industrial hygienist on the 1000/2000 Division ES&H Team to determine the appropriate type of glove to be worn.

When working with concentrated acids/bases (corrosives), butyl gloves would be worn instead of latex, vinyl, or nitrile, and would be worn with the other PPE (safety glasses with side shields). When pouring large quantities (> 1 liter) of concentrated acids/bases, or any other handling of these materials that may result in a splash, a face shield would be worn over the safety glasses, since corrosives cause irreversible damage to tissue such as eyes.